

A DESCRIPTION OF THE LARVA OF *ARGIA FUNCKI* (SELYS, 1854)  
(ODONATA: ZYGOPTERA: COENAGRIONIDAE)

RODOLFO NOVELO-GUTIÉRREZ AND JOSÉ ANTONIO GÓMEZ-ANAYA

Instituto de Ecología, A.C., Departamento de Entomología. Apartado Postal 63, 91070 Xalapa, Veracruz, Mexico (e-mails: novelor@ecologia.edu.mx; anaya@ecologia.edu.mx)

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*Abstract.*—The last instar larva of *Argia funcki* (Selys) is described and illustrated. A comparison to its closest relative, *Argia lugens* (Hagen), is provided. The scalelike setae on sternite 8 and gonapophyses, and the bluntly-tipped gonapophyses easily separate *A. funcki* larva from that of *A. lugens*. The larva of *A. funcki* belongs to the group of species with ligula very prominent and one palpal seta; it is the largest of all known larvae of the genus.

*Resumen.*—Se describe e ilustra el último estadio larval de *Argia funcki* (Selys), y se le compara con su pariente cercana *Argia lugens* (Hagen). Las sedas escamiformes en el esternito 8 y en las gonapófisis, así como la punta roma de estas últimas, diferencian fácilmente a la larva de *A. funcki* de la de *A. lugens*. La larva de *A. funcki* pertenece al grupo de especies con lígula muy prominente y una seda en el palpo; es la más grande de todas las larvas del género.

*Key Words:* Odonata, Zygoptera, Coenagrionidae, *Argia funcki*, larva, description, Mexico

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*Argia funcki* (Selys 1854) is a species restricted to Mexico and Guatemala (Paulson 1982) and the largest species of the genus. Together with its closest relative *A. lugens* (Hagen 1861), it belongs to the subgenus *Hyponeura* Selys. Recently, Paulson (2002) reported a population of *A. funcki* from Nayarit, Mexico, in which the adult males show an unusual, non-metallic bright red coloration. We observed the same coloration in the population from which we obtained the larvae for this study, located at Michoacán State, Mexico (Río Pinolapa), as well as a dichromatism in females: blue and brown morphs.

The larva of *A. lugens* was first described by Needham and Cockerell (1903), and partially illustrated by Needham (1904), and more recently by Novelo-Gutiérrez (1992). In this paper we describe, for the first time,

the last instar larva of *A. funcki*. Although we did not rear specimens until emergence, there is a reasonable certainty that they belong to that species.

*Argia funcki* (Selys)  
(Figs. 1–10)

*Material studied.*—Four exuviae (♂), 1 last instar larva (♂), 2 penultimate instar larvae (♂), 3 antepenultimate instar larvae (1 ♂, 2 ♀). MEXICO: Hidalgo; Pemuxtitla, Río Zacuala (900 m), 18 April 1998, R. Novelo leg., 3 ♂ (exuviae); Michoacán; Tepalcatepec, Río Pinolapa (625 m), 16 May 2002, J.A. Gómez leg., 1 ♂ (exuvia); same data but 12 March 2004, R. Novelo leg., 4 ♂, 2 ♀. All material deposited in Colección Entomológica del Instituto de Ecología, A.C. (IEXA), Xalapa.

*Description.*—Exuviae yellowish to yel-

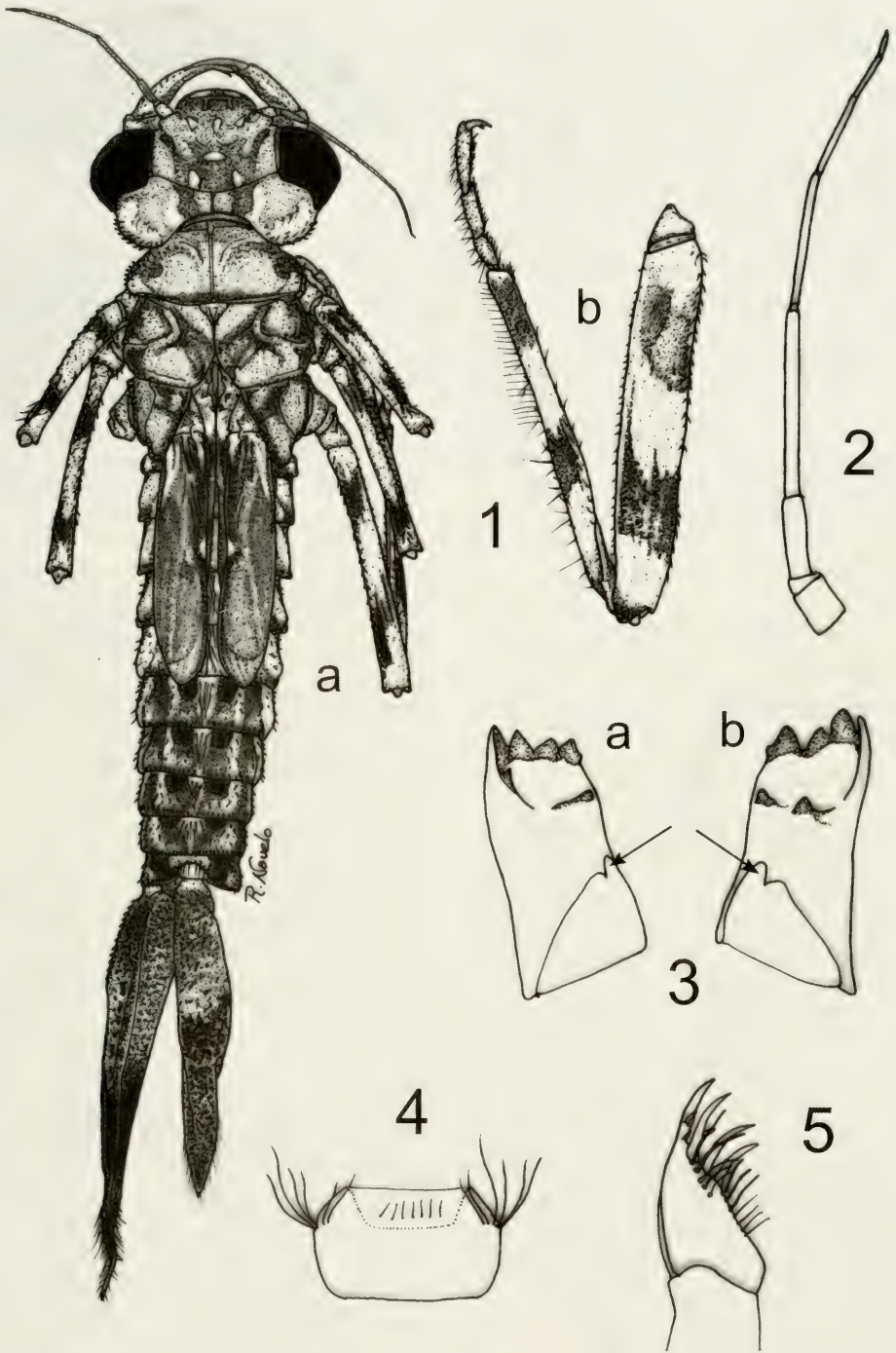
lowish brown, larvae mottled brown on yellow background on dorsum, yellow to reddish yellow on venter; body robust and short, integument more spiny than setose; epiproct and paraprocts (caudal lamellae) obscurely mottled, swollen basally (Fig. 1a).

*Head:* Color pattern as in Fig. 1, wider than long, dorsoventrally flattened, cephalic lobes large and bulging, covered with robust spiniform setae on posterior and inferior surfaces. Medial margin of compound eyes straight. Labrum setose, dark brown with a large pale spot on each side of midline; anteclypeus dark brown, with a row of long setae on boundary with postclypeus, remainder of head light brown and quite smooth; occipital margin widely concave, with a thickened ridge at middle, becoming gradually thinner at sides. Antenna 7-segmented (Fig. 2), scape creamy, remainder of antenna reddish yellow, relative size of antennomeres: 0.25, 0.45, 1.0, 0.7, 0.5, 0.25, 0.15. Mandibles (Fig. 3) with 4 incisor cusps; right mandible with an extra cusp at base of largest ventral cusp, molar area with one small, blunt cusp; molar area of left mandible with two small blunt cusps; a dorsobasal emargination in both mandibles (see arrow on Fig. 3). Ventral pad of hypopharynx more or less rectangular, with a tuft of 7–8 long setae located subapically to each anterolateral corner, and a transverse row of smaller setae on anterior margin (Fig. 4). *Maxilla:* Galeolacinia (Fig. 5) with 6 teeth, three dorsal teeth more or less of same size, three ventral teeth of different sizes, apical one longest, a row of stiff setae preceding both ventral and dorsal teeth. *Labium:* Prementum–postmentum articulation reaching basal half of mesosternum; prementum (Fig. 6a) longer than wide, colored ventrally as follows: a subrhomboidal, whitish, central area except tip of ligula reddish yellow; a wide, dark brown band on each side of whitish area, converging basally; lateral borders creamy pale; a row of 37–40 spiniform setae along lateral margins, 13–18 basidorsal spiniform setae; lig-

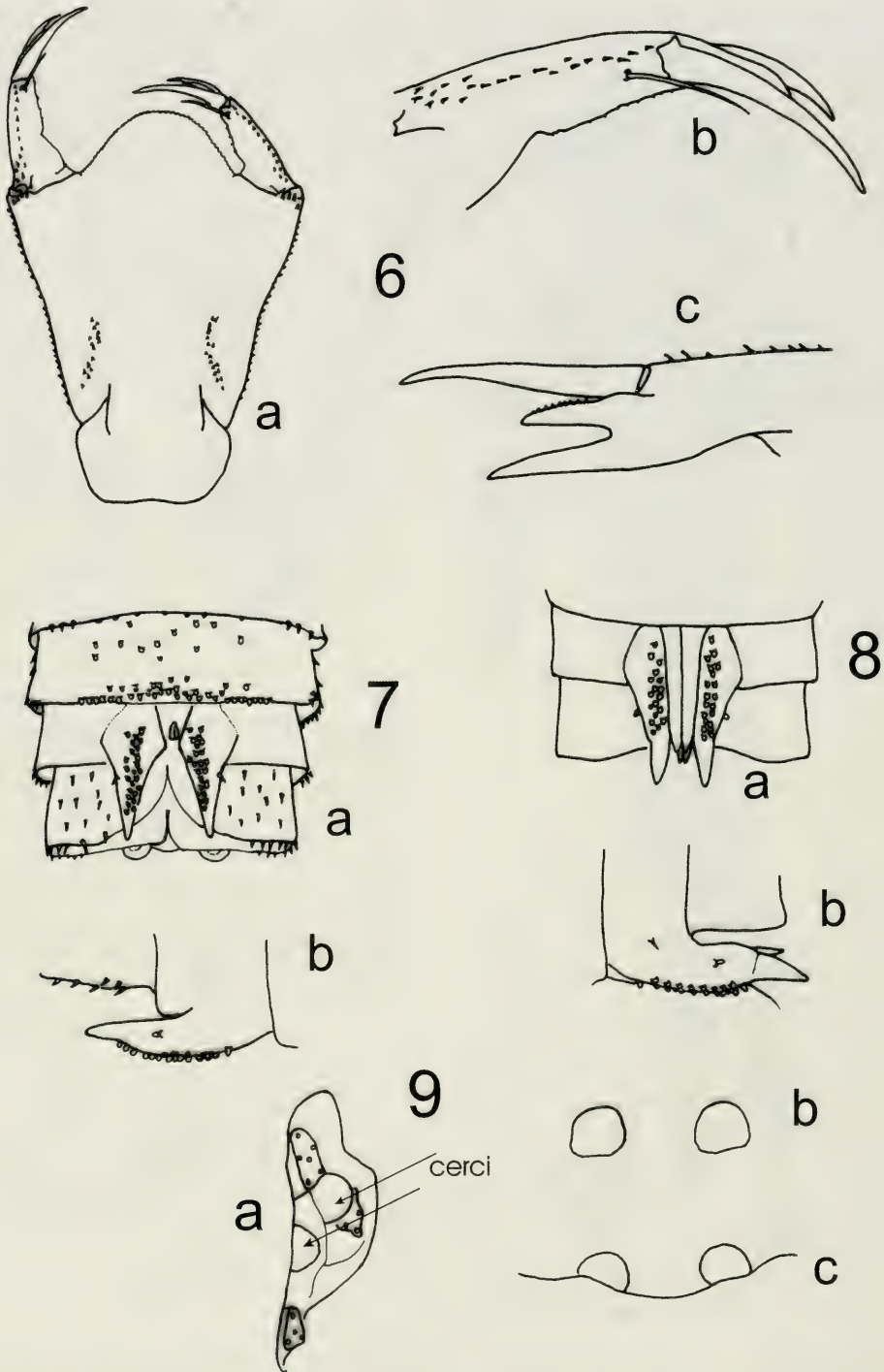
ula very prominent, its apical margin finely serrulate. Palp bicolored, creamy yellow dorsally, dark brown ventrally, with one long seta and several spiniform setae along its dorsal border, ventral margin serrated (Fig. 6b); dorsal margin of dorsal end hook serrated (Fig. 6c); movable hook long and sharp.

*Thorax:* Pronotal disc spiny at sides, posterior border widely convex and thickened. Synthorax robust, anterior wing sheaths extending to basal 0.6 of abdominal segment 5, posterior ones extending slightly beyond posterior margin of segment 5, yellow brown with diffuse whitish spots at base, nodus, tips, and external borders. Legs yellow, with two dark rings on femora and tibiae (Fig. 1b); basal tarsomeres light brown, apical one brown; claws yellow; femora flattened laterally, with two rows of spiniform setae on dorsal and ventral borders, profemora also with spiniform setae on anterior (external) surface; tibiae with one row of spiniform setae on anterior (external) and posterior (internal) borders, as well as abundant, delicate, white, long setae on anterior surfaces; tarsi with two ventral rows of abundant, short, stout setae, either bi- or tridentate on apical tarsomeres, and long setae on dorsum.

*Abdomen:* Cylindrical, tapering caudad gradually, with a pattern of alternating pale and dark longitudinal bands (Fig. 1), pale middorsal band with tufts of long, brown setae; posterior and lateral margins and dorsal surface of tergites 5–10 with reddish-brown spiniform setae; posterior margin of tergite 10 deeply emarginated. Sternites 1–5, and most of 6 quite smooth, with some spiniform setae on posterior margin of 6; posterior margins of sternites 7–8, and central area of 8 with scalelike setae (Fig. 7a); posterior margins of sternites 9–10, and entire surface of 10 with spiniform setae (Fig. 7a). Male gonapophyses pyramidal, bluntly-tipped, in ventral view (Fig. 7a) slightly divergent and reaching posterior margin of sternite 10, with 23–24 scalelike setae on their ventral borders, and one scalelike seta



Figs. 1-5. Morphology of *Argia funcki* larva. 1, Last instar larva: (a) dorsal view; (b) left hind leg, lateral view. 2, Right antenna, lateral view. 3, Mandibles, ventrointernal view: (a) right mandible; (b) left mandible (arrow indicates the emarginations). 4, Ventral pad of hypopharynx, ventral view. 5, Right galeolacinia, ventrointernal view.



Figs. 6-9. Details of the morphology of *A. funcki* larva. 6, Prementum: (a) dorsal view; (b) detail of left palp, dorsal view; (c) detail of left palp, frontolateral view. 7, Details of male abdomen: (a) sternites 8-10 showing gonapophyses and types of setae, ventral view; (b) gonapophyses, right lateral view. 8, Details of female abdomen: (a) sternites 9-10 showing gonapophyses, ventral view; (b) gonapophyses, left lateral view. 9, Male cerci: (a) laterodorsal view; (b) posterior (caudal) view; (c) dorsal view.

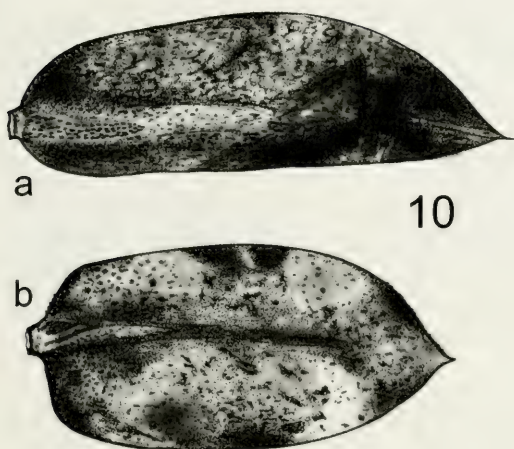


Fig. 10. Caudal lamellae of *A. funcki* larva: (a) left paraproct, lateral view; (b) epiproct, left lateral view.

on external surface (Fig. 7b). Female gonapophyses (antepenultimate instar): laterals surpassing posterior margin of sternite 10, ending in long, parallel, blunt tips (Fig. 8a); ventral border with more or less three rows of 23–24 scalelike setae over basal 0.75, and one scalelike seta on external surface; central valvae smooth, shorter than laterals. Male cercus short, apically rounded (Fig. 9). *Caudal lamellae*: Paraproct (Fig. 10a) swollen at basal 0.7, laminar at apical 0.3, oblong, heavily mottled, ending in a short, apical filament, three times longer than its widest part, ventral margin roughly straight, dorsal margin more or less parallel to ventral one at basal 0.65, then curving downward gradually on apical 0.35; dorsal and ventral borders with small spiniform setae on basal 0.03, and white, delicate, hairlike setae on apical 0.2 and 0.3, respectively; a thick lateral carina on basal 0.3 beset with a patch of 4–5 rows of reddish-yellow spiniform setae. Epiproct (Fig. 10b) swollen on basal 0.6, laminar on apical 0.4, heavily mottled, ending in a small tip, two times longer than its widest part, dorsal and ventral margins more or less straight and parallel along basal 0.65, then gradually converging at apical 0.35, dorsal margin with spiniform setae at basal 0.01, and white, delicate, hairlike setae on apical 0.2; thick

lateral carinae with 2–3 rows of reddish yellow, spiniform setae on basal 0.07.

*Measurements* (mm) (last instar larva only): total length (excluding caudal app.), 20.0; abdomen (ventral), 11.0; maximum width of head, 6.1; metafemur (dorsal margin), 6.0; epiproct, 7.6; paraproct, 10.0.

*Remarks*.—*Argia funcki* inhabits shallow, rocky streams. Mature larvae were found close to the edge, in areas with abundant cobble and where the water flow is very slow or absent. The larvae were very hard to find; it was necessary to pick up individual rocks to capture them. Mature larvae are apparently present only during a brief period of the dry season (late March to early April), at least in Río Pinolapa (Michoacán); during this time, they are separated from each other in isolated, small pools formed by water evaporation at the stream edges. This isolation probably helps them to avoid predation by fish, which were very abundant at the central, mainstream, water flow. No *A. funcki* larvae were found latter microhabitat.

*Discussion*.—The larva of *Argia funcki* belongs to the group of species with one palpal seta and very prominent ligula, and it is the largest of all known *Argia* larvae (although Novelo-Gutiérrez, 1992, Table 1, recorded a total length for males of *A. lacrimans* of 21–21.9 mm, these measurements were made from alcoholic specimens with the abdomen relaxed, with several of the intersegmental membranes exposed). It shows a great resemblance to its closest relative *A. lugens*. The main features that distinguish both species at the larval stage are (*A. lugens* in parentheses [cf., Novelo-Gutiérrez (1992)]): a larger stature [total length excluding app. 20 mm] (smaller, 14.6–18.7 mm); a large size proportion between 3rd antennomere and scape and pedicel [1.0, 0.25, 0.45, respectively] (smaller size proportion, 1.0, 0.35, 0.55, respectively); a smaller size proportion between 3rd and 4th antennomeres [1.0, 0.7, respectively] (larger size proportion, 1.0, 0.6, respectively); lateral margins of prementum with spini-

form setae all the way along, excepting extreme base (spiniform setae at apical 0.60, only); scalelike setae on sternite 8 and gonapophyses (spiniform setae on these structures); male and female gonapophyses bluntly-tipped (sharply pointed); lateral carina of paraproct short and rounded, and with spiniform setae only (larger and sharp, with spiniform setae intermingled with stiff, hairlike setae); epiproct and paraprocts densely mottled on pale background (usually uniformly dark except for pale tip).

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